600 INCIDENTALS

ITEM 610 - CELLULAR RETAINING WALLS

610.01 Description. This work shall consist of constructing retaining walls composed of a series of cells formed by assembling precast reinforced concrete or galvanized metal units to form walls of satisfactory stability, in reasonably close conformity with lines, grades and dimensions specified or ordered.

(a) Concrete cellular walls shall consist of a series of rectangular or triangular cells formed by building up tiers of precast reinforced concrete units. If cells are rectangular the units shall be known as headers and stretchers and if the cells are triangular the stretcher and header shall be jointed into one unit at the time of manufacture and adequately reinforced with steel at this point. The face of the wall shall be closed by inserting precast concrete filler slabs between the rows of stretchers, allowing sufficient clearance between ends of slabs and headers for drainage; or in the instance of triangular type cribbing the stretcher portion of the units shall be spaced approximately 1/2 inch (12.7 mm) apart by means of lugs formed on the under side of the stretcher portion, such lugs to act as a continuous vertical bearing between the units and same shall be spaced at a distance not exceeding 3 feet (0.9 m) from center to center.

In the instance of header and stretcher type cribbing the headers shall have lugs formed thereon which interlock with the stretchers at the front and rear of the wall, and shall not appreciably project beyond the face of the wall. Sufficient clearance or tolerance shall be made on the lugs of headers to permit proper flexibility of movement in the interlocking joints.

No metal pin or dowel connected cribbing will be permitted.

(b) Metal cellular retaining walls shall consist of a plurality of pairs of columns, one column of each pair being in the place of the front of the wall and the other being in the plane of the rear of the wall, with the pairs of columns

spaced longitudinally with overlapping S-shaped facing and rear members and transversely with overlapping U-shaped members.

The necessary bolts and appurtenances shall be furnished for complete assembly of the units into a closed-face wall of connecting bins.

The units in the wall shall conform to the dimensions and gauges specified, and when assembled shall present a uniform and workmanlike appearance.

610.02 Approval by City. The Contractor shall, within 15 days after the award of the contract, submit drawings of the units to be furnished, together with a proposed erection plan and schedule of operations.

The drawing of the units, the erection plan and the schedule of operations shall all be approved before any material is delivered on the project.

Only walls produced by manufacturers whose type of wall, and design of units comprising same, has been in successful commercial use for a period of at least three years will be considered for approval.

Materials shall be sampled and tested as directed by the Engineer.

610.03 Materials. Manufactured units shall be as follows:

(a) **Concrete Cellular Wall.** The units shall consist of concrete into which steel has been embedded in such a manner that the steel and concrete act together in resisting force.

Concrete shall conform to 499, Class C, except for aggregate gradation.

Reinforcing steel shall conform to 509.02.

(b) **Galvanized Metal Wall.** The units shall be made from galvanized metal sheets. The base metal shall conform to AASHTO M 218. The sheets shall be galvanized on both sides by the hot-dip process. The average splatter coating shall be not less than 2 ounces per square foot (610 g/m^2) on each side nor shall the measurement of any 2 1/4 x 2 1/2 inch (56.4 x 62.7 mm) area indicate less than 1.8 ounces per square foot (550 g/m^2) on each side of double exposed surface. The finished sheets shall be of first-class commercial quality, free from injurious defects, such as blisters, flux, and uncoated spots.

All metal sheets used in making the various units shall have a minimum thickness of 0.057 inch (1.45 mm), unless otherwise shown on the plans.

The manufacturer shall furnish three copies of an "Analysis and Coating Test Certificate" containing the following information covering each project or order on which galvanized metal walls are furnished.

(a) Heat or heats used for units.

(b) Analysis of each heat.

(c) Amount of splatter coating for each heat.

(d) Total units of each size and gauge.

(e) Name of Contractor.

(f) Name of street, road, or state route number, and section.

(g) Project number or state purchase order number.

This certificate shall be sworn to by a person having legal authority to bind the company. Two copies of the certificate shall be sent to the Engineer.

Galvanized bolts shall be 5/8 inches (15.9 mm) in diameter and shall have a minimum length of 1 1/4 inches (31.8 mm) measured from the underside of the bolt head. They shall be galvanized in accordance with 711.02.

610.04 Manufacture of Units.

(a) Concrete cellular wall units shall be cast in substantial, unyielding steel forms. The forms shall be properly assembled, cleaned and oiled before any concrete is placed therein. During the placing and setting of the concrete, the forms shall be rigidly held in place on a smooth and level platform.

The reinforcement must be so held in the required position in the forms that it will not be displaced during pouring of the concrete.

Satisfactory vibration shall be given the fresh concrete to insure filling all space in the form, to densify the concrete, and to completely and intimately contact the reinforcement. Over-vibration or over-spading causing segregation of the concrete materials will not be permitted, and such units with segregated areas shall be rejected.

The units shall be covered with burlap, cotton mat or jute felt cotton mats and be kept wet at least 7 days; or steam cured for a period of not less than 24 hours.

Reinforced concrete units will be subject to rejection for any of the following reasons:

(1) exposure of the reinforcing;

(2) defects which indicate imperfect mixing, placing or curing; and

(3) fractures and cracks, except that small palls or broken edges may not be considered cause for rejection.

(b) Galvanized metal cellular wall units shall be so fabricated that units of the same nominal size shall be fully interchangeable. No drilling, punching, or drifting to correct defects in manufacture will be permitted. Any units having holes improperly punched shall be promptly replaced by the manufacturer free of charge.

Whenever possible in the manufacture of the units, a minimum forming radius of 1 inch (25 mm) shall be maintained. All units formed with less than 1 inch (25 mm) radius shall be hot-dipped galvanized after forming.

610.05 Excavation. Excavation, including accurate grading for foundation, will be measured and paid for as Item 203. Bearing for the foundation of the walls shall be firm and to grade and shall be approved by the Engineer before erection of the wall.

610.06 Backfill. Below the elevation of the proposed ground line at the face of the wall, the interior of the cell spaces formed by the units shall be filled with soil as defined in Section 203.02. Above the elevation of the proposed ground line at the face of the wall, the interior of the cell spaces formed by the units shall be filled with subbase material conforming to Section 310.02 Grading A except that the material shall contain not more than 5 percent passing the No. 200 sieve (75μm).

The material shall be placed in layers not to exceed 6 inches (152 mm) compacted depth and compacted to the density established as satisfactory by the Engineer. Compaction shall be obtained by means of approved tampers or compactors.

Water may be required as directed by the Engineer to assist in obtaining the desired compaction.

The space behind the wall shall be filled in accordance with Section 503.10 except as noted below.

Backfill, including the interior filling, shall be made simultaneously with the erection of the wall, following the progress of erection as closely as the type of construction will permit.

Rolling equipment shall not be used directly over a portion of the wall until at least a 12 inch (305 mm) thickness of compacted fill has been placed to prevent damage to the units of the wall.

The compacted backfill, including the interior filling, and water will be included for payment in the unit price bid per square foot (square meter) of facial area of cellular retaining wall.

610.07 Construction Methods. The individual types of walls shall be constructed as follows:

(a) **Concrete Cellular Wall.** Sills shall be placed with exactness to the required grade and alignment and be supported on firm foundation material for their entire length. Shimming with loose earth, stones, etc., will not be permitted.

The headers shall be placed perpendicular to the sills and stretchers, and interlocked. Templates shall be used to insure that the members are placed in proper position.

Before placing units, two layers of asphalt impregnated paper shall be spread on all points of contact of the units to insure a uniform bedding.

When the wall has been constructed two tiers high, alignment, grade, and batter shall be checked, adjusted if necessary, and backfill completed to this height before subsequent units are added. The remainder of the wall will then be completed. Templates shall be used to insure proper face batter.

(b) **Corrugated Metal Wall.** Foundations for the bearing plates at the corners of the bins shall be firm and to grade.

When the columns have been placed and the wall constructed two tiers high, alignment, grade and batter shall be checked, adjusted if necessary, and backfill completed to this height before subsequent units are added. The remainder of the wall will then be completed.

Templates shall be used to insure that members are placed in proper position and to secure proper batter.

Members shall be handled carefully, and any which are damaged shall be removed and replaced at the Contractor's expense.

610.08 Method of Measurement. The quantity measured will be the actual number of square feet (square meters) of facial area of approved cellular retaining wall

measured complete in place. Excavation will be measured by the cubic yard (cubic meter) as provided in Item 203.

610.09 Basis of Payment. Accepted quantities of cellular retaining wall will be paid for at the contract price per square foot (square meter). These prices shall include compensation for all materials, backfill and disposal of surplus materials.

Payment will be made under:

Item	Unit	Description
610	Square Foot (Square Meter)	Cellular Retaining Wall